U.S. Department of Transportation

Intelligent Transportation Systems Standards Fact Sheet

July 2001

NTCIP 9001 (Draft) National Transportation Communications for ITS Protocol (NTCIP) Guide

Note: The NTCIP Guide supersedes NEMA TS 3.1, NTCIP Overview

Overview: NTCIP is a family of standards that provides both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. The NTCIP is the first set of standards for the transportation industry that allows traffic control systems to be built using a "mix and match" approach with equipment from different manufacturers. Therefore, NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software. To assure both manufacturer and user community support, NTCIP is a joint product of the National Electronics Manufacturers Association (NEMA), the American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE).

To obtain a copy of this draft standard, please contact one of the following:

American Association of State Highway and Transportation Officials (AASHTO)

Institute of Transportation Engineers (ITE)

National Electrical Manufacturers Association (NEMA)

(Contact information is shown at the end of this fact sheet)

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For current information on the status of this document or to download the latest version, check the NTCIP Web site at www.ntcip.org

Human communications—the exchange of ideas and information—relies on rules of etiquette to enable the members of a conversation group to communicate in an orderly manner. Computer communication—the exchange of data and information—relies on a similar set of rules called "protocols" that allow computers to exchange information. Just as different rules of etiquette apply to different kinds of groups and communications media, the NTCIP establishes sets of different protocols suited to specific network communications needs.

Human communication also relies on a vocabulary of words, each defined with a fixed meaning and spelling and each understood by the members of the conversation group. Computers have a similar vocabulary, called "objects" in the NTCIP standards. These objects define all possible commands, responses and information that may be exchanged among microprocessor-controlled electronic equipment, a central computer, and, by extension, their human operators. The NTCIP groups these objects by subject material (e.g., traffic signal controller) and calls these groupings "object definitions."

What is this standard for? NTCIP 9001, NTCIP Guide, provides an introduction to the NTCIP family of standards and an overview as to how the various protocols and object definitions are used. Much of this introductory material was first published in 1996 as NEMA TS 3.1 (NTCIP Overview). The Guide is a newer and more complete document than the NTCIP Overview and contains additional information about the NTCIP family of standards. Using the Guide, one may select the communications protocol best suited to meet the needs of either an existing traffic control network or a network developed to handle the specific traffic control needs for a municipality or region.

Historically, there have been no information transfer standards used by the various manufacturers of traffic control and signaling equipment. When equipment, especially microprocessor-controlled equipment, and systems from different manufacturers are integrated into a centrally controlled system, the communications protocol, commands and responses, and sensor data may be different for each item and may be manufacturer-specific. The lack of standardization made it difficult for users to combine equipment from different manufacturers into a system, resulting in higher costs. However, because NTCIP establishes national standards for communications protocols and information objects, it allows traffic control equipment from multiple vendors to interoperate. It meets existing traffic control functional requirements, supports traffic management communications, and lends itself to future, not-yet-defined traffic applications for ITS. NTCIP embraces features of existing worldwide and U.S. national interconnectivity standards on how information is passed in open systems. The NTCIP standards provide the mechanisms to exchange information between traffic control and/or ITS devices.

Who uses it? This document is intended for traffic managers, traffic engineers and communications engineers involved in the specification, selection, procurement, installation, operation or maintenance of electronic traffic control equipment (including sensors, signals, dynamic message signs, etc.). The **NTCIP Guide** is also designed as an educational tool for decision-makers, planners, specification writers, and implementers.

How is it used? The **NTCIP Guide** can be used to obtain an overview of the NTCIP family of standards and as a foundation to understand and use related, more detailed standards in the NTCIP family. It can also be used to select standards from the NTCIP family to address specific functional needs for a particular traffic management system.

Scope: This 155-page document encompasses the following major sections:

a. *Understanding NTCIP*, a general-purpose technical overview of the issues associated with using NTCIP;
b. *Procuring NTCIP*, a guide for specification writers that describes how to determine the technical requirements of a communications infrastructure and the various options that are needed for a particular deployment;
c. *Designing NTCIP* helps designers choose the correct communications components of a transportation system, including bandwidth analysis and system timing; and
d. *Implementing NTCIP*, an aide to help systems implementers achieve successful deployments.

The guide also contains reference sections and other practical information such as a "lessons learned" section that details the results of early NTCIP deployments.

Related documents: To accommodate the broad scope of the NTCIP, this family of standards contains a variety of communications standards and object definitions. At present, the following standards are defined or proposed:

a. Background
   1. **NTCIP 9001, National Transportation Communications for ITS Protocol (NTCIP) Guide (formerly NEMA TS 3.1, NTCIP Overview) [this standard]**

b. Communications Standards
   1. NTCIP Base Standard for Simple Transportation Management Framework (STMF) (NTCIP 1101, formerly NEMA TS 3.2-1996)
   2. NTCIP Class B Profile (NTCIP 2001, formerly NEMA TS 3.3-1996)
   3. NTCIP Class A and Class C Profiles (NTCIP 2002)
   4. NTCIP Framework and Classification of Profiles (NTCIP 8003)
   5. NTCIP Application Profile - Common Object Reference Broker Architecture (CORBA) (NTCIP 2305)
   6. NTCIP Application Profile – Data Exchange-ASN.1 (DATEX) (NTCIP 2304)
   7. NTCIP Simple Transportation Management Framework - Application Profile (NTCIP 2301)
   8. NTCIP File Transport Protocol - Application Profile (NTCIP 2303)
   9. NTCIP Trivial File Transfer Protocol - Application Profile (NTCIP 2302)
   10. NTCIP Internet (UDP/IP and TCP/IP) Protocols - Transport Profile (NTCIP 2202)
   11. NTCIP Null Transport - Transport Profile (NTCIP 2201)
   12. NTCIP Point-to-Multi-Point Protocol using RS 232 - Subnetwork Profile (NTCIP 2103)
   13. NTCIP Point-to-Multi-Point Protocol using FSK Modems - Subnetwork Profile (NTCIP 2102)
   14. NTCIP Ethernet - Subnetwork Profile (NTCIP 2104)
   15. NTCIP Base Standard for Octet Encoding Rules (NTCIP 1102)
   16. NTCIP Technical Report on Assigned Numbers - Part 1 Identifiers (NTCIP 7001)
   17. NTCIP Technical Report on Assigned Numbers - Part 2 IP Addresses (NTCIP 7002)

c. Device Object Definitions
   1. NTCIP Global Object (GO) Definitions (NTCIP 1201, formerly NEMA TS 3.4-1996)
   2. NTCIP Objects for Actuated Signal Controller (NTCIP 1202, formerly NEMA TS 3.5-1996)
   3. NTCIP Objects for Dynamic Message Signs (NTCIP 1203, formerly NEMA TS 3.6-1997)
   4. NTCIP Objects for Environmental System Sensors (NTCIP 1204, formerly NEMA TS 3.7-1998)
   5. NTCIP Objects for Closed Circuit Television Control (NTCIP 1205)
   6. NTCIP Objects for Ramp Meter Control (RMC) (NTCIP 1207)
   7. NTCIP Objects for Data Collection Management (DCM) (NTCIP 1206)
   8. NTCIP Objects for Transportation System Sensor (NTCIP 1209)

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